

Claims

- [c1] Wherefore, what is claimed is:
1. A computer-implemented process for obtaining progressively higher quality versions of an audio and/or video program over a client-server based network, comprising a client computer performing the process actions of:
requesting a base quality version of the program from a server over the network, wherein the base quality version of the program comprises at least a base layer of a layered unicast;
receiving and caching the requested layer data associated with the base quality version of the program;
requesting at least one enhancement layer of the layered unicast from the server over the network;
receiving and caching the requested enhancement layer data; and
combining the requested enhancement layer data with the previously cached layer data associated with the base quality version of the program as it is received to produce a higher quality version of the program.
 - [c2] 2. The process of Claim 1, further comprising a process action of rendering the base quality version of the program as the requested data is received and presenting it to the user.
 - [c3] 3. The process of Claim 2, further comprising the process actions of:
determining if the user directs that the presentation of the base quality version of the program be terminated;
terminating the presentation of the base quality version of the program to the user.
 - [c4] 4. The process of Claim 3, wherein the process action of terminating the presentation comprises the action of terminating the incoming data stream associated with the requested base quality version of the program.
 - [c5] 5. The process of Claim 3, wherein the process action of terminating the presentation comprises the actions of stopping the rendering of the base quality version of the program, while continuing to receive and cache the

incoming data stream associated with the requested base quality version of the program.

- [c6] 6. The process of Claim 1, further comprising a process action of rendering the higher quality version of the program from the combined layer data and presenting it to the user.
- [c7] 7. The process of Claim 6, further comprising the process actions of:
determining if the user directs that the presentation of the higher quality version of the program be terminated;
terminating the presentation of the higher quality version of the program to the user.
- [c8] 8. The process of Claim 7, wherein the process action of terminating the presentation comprises the action of terminating the incoming data stream associated with the requested higher quality version of the program.
- [c9] 9. The process of Claim 7, wherein the process action of terminating the presentation comprises the actions of stopping the rendering of the higher quality version of the program, while continuing to receive and cache the incoming data stream associated with the requested higher quality version of the program.
- [c10] 10. The process of Claim 1, wherein the process actions of requesting at least one enhancement layer, receiving and caching the requested enhancement layer data and combining the requested enhancement layer data with the previously cached layer data associated with the base quality version of the program as it is received to produce said higher quality version of the program, are performed only when a user directs the client to provide a higher quality version of the program in comparison to the base quality version.
- [c11] 11. The process of Claim 1, wherein the process actions of requesting at least one enhancement layer, receiving and caching the requested enhancement layer data and combining the requested enhancement layer

data with the previously cached layer data associated with the base quality version of the program as it is received to produce said higher quality version of the program, are performed automatically once all the requested layer data associated with the base quality version of the program has been received and cached.

[c12] 12. The process of Claim 1, further comprising the process actions of: requesting at least one additional enhancement layer of the layered unicast from the server over the network; receiving and caching the requested additional enhancement layer data; and combining the requested additional enhancement layer data with the previously cached layer data associated with the base and higher quality versions of the program as it is received to produce an enhanced higher quality version of the program.

[c13] 13. The process of Claim 1, further comprising the process actions of: ascertaining whether the server has any remaining enhancement layers associated with the program available; and whenever it is ascertained that the server has at least one remaining enhancement layer associated with the program, requesting at least one additional enhancement layer of the layered unicast from the server over the network, receiving and caching the requested additional enhancement layer data, and combining the requested additional enhancement layer data with the previously cached layer data associated with the base and higher quality versions of the program as it is received to produce an enhanced higher quality version of the program.

[c14] 14. The process of Claim 13, wherein the process actions of requesting at least one additional enhancement layer, receiving and caching the requested additional enhancement layer data and combining the requested additional enhancement layer data with the previously cached layer data associated with the base and higher quality versions of the program to produce said

enhanced higher quality version of the program, are performed only when a user directs the client to provide the enhanced higher quality version of the program.

[c15] 15. The process of Claim 13, wherein the process actions of requesting at least one additional enhancement layer, receiving and caching the requested additional enhancement layer data and combining the requested additional enhancement layer data with the previously cached layer data associated with the base and higher quality versions of the program to produce said enhanced higher quality version of the program, are performed automatically once all the requested layer data associated with the higher quality version of the program has been received and cached.

[c16] 16. The process of Claim 13, further comprising a process action of informing the user that an enhanced higher quality version of the program cannot be provided whenever it is ascertained that the server does not have any remaining enhancement layers associated with the program available.

[c17] 17. The process of Claim 1, wherein the layers of the layered unicast are related hierarchically in that the lowest level layer is a base layer and each subsequently higher level layer adds enhancing information for enhancing the quality of the program that can be rendered from the layers preceding it in the hierarchy, and wherein the process action of requesting a base quality version of the program from a server over the network comprises the action of requesting as many layers, in the order of their position in the hierarchy starting with the base layer, as can be transmitted from the server to the client without exceeding the available bandwidth of the network.

[c18] 18. The process of Claim 17, wherein the process action of requesting at least one enhancement layer, comprises the action of requesting as many enhancement layers, in the order of their position in the hierarchy starting with the layer next higher in the hierarchy from the highest level layer requested in association with the base quality version of the program, as can be transmitted from the server to the client without exceeding the available

bandwidth of the network.

[c19] 19. The process of Claim 1, wherein the process actions of requesting a base quality version of the program and requesting at least one enhancement layer comprises requesting that the data making up each layer be provided in its entirety.

[c20] 20. The process of Claim 1, wherein the process action of requesting a base quality version of the program comprises the action of requesting the data making up each layer of the base quality version in sequential, equal-sized, temporally corresponding portions such that the layer portions associated with a time segment at the beginning of the program are requested first, and then the layer portions associated with the next sequential time segment of the program are requested, and so on.

[c21] 21. The process of Claim 20, wherein the layers of the layered unicast are related hierarchically in that the lowest level layer is a base layer and each subsequently higher level layer adds enhancing information for enhancing the quality of the program that can be rendered from the layers preceding it in the hierarchy, and wherein the process action of requesting the data making up each layer of the base quality version in sequential, equal-sized, temporally corresponding portions comprises the action of requesting said layer portions from as many layers, in the order of their position in the hierarchy starting with the base layer, as can be transmitted from the server to the client without exceeding the available bandwidth of the network.

[c22] 22. The process of Claim 20, wherein the process action of requesting at least one enhancement layer of the program comprises the action of requesting the data making up each enhancement layer in sequential, equal-sized, temporally corresponding portions such that the layer portions associated with time segment at the beginning of the program are requested first, and then the layer portions associated with the next sequential time segment of the program are requested, and so on.

- [c23] 23. The process of Claim 22, wherein the process action of requesting the data making up each enhancement layer in sequential, equal-sized, temporally corresponding portions, comprises the action of requesting said enhancement layer portions from as many enhancement layers, in the order of their position in the hierarchy starting with the layer next higher in the hierarchy from the highest level layer requested in association with the base quality version of the program, as can be transmitted from the server to the client without exceeding the available bandwidth of the network.
- [c24] 24. The process of Claim 22, wherein the length of each time segment of the program is matched to the rate at which the available bandwidth varies on the network such that each time segment is short enough that the network bandwidth does not vary significantly over the period.
- [c25] 25. A client-server based computer network for obtaining progressively higher quality versions of an audio and/or video program, comprising:
a client comprising at least one general purpose computing device; and
a computer program comprising program modules executable by the client, wherein the client is directed by the program modules to,
receive an instruction from a user to provide the program for viewing,
request a base quality version of the program from a server over the network, wherein the base quality version of the program comprises at least a base layer of a layered unicast,
receive and cache the requested layer data associated with the base quality version of the program,
render the base quality version of the program as the requested data is received and present it to the user,
determining if the user directs that a higher quality version of the program be provided for viewing,
whenever it is determined that the user has directed a higher quality version of the program to be provided,
request at least one enhancement layer of the layered unicast from the server over the network,

receive and cache the requested enhancement layer data,
combine the requested enhancement layer data with the previously cached
layer data associated with the base quality version of the program as it is
received to produce the higher quality version of the program, and
render the higher quality version of the program from the combined layer
data and present it to the user.

[c26] 26. The network of Claim 25, further comprising a program modules for:
determining if the user directs that the presentation of the base quality
version of the program be terminated;
whenever it is determined that the user has directed that the presentation of
the base quality version of the program be terminated, terminating said
presentation.

[c27] 27. A computer-readable medium having computer-executable instructions
for obtaining progressively higher quality versions of an audio and/or video
program over a network, said computer-executable instructions comprising:
requesting a base quality version of the program, wherein the base quality
version of the program comprises at least a base layer of a layered unicast;
receiving and caching the requested layer data associated with the base
quality version of the program;
rendering the base quality version of the program as the requested data is
received and presenting it to the user;
upon a user directing that a higher quality version of the program being
provided, requesting at least one enhancement layer of the layered unicast
from the server over the network;
receiving and caching the requested enhancement layer data;
combining the requested enhancement layer data with the previously cached
layer data associated with the base quality version of the program as it is
received to produce a higher quality version of the program; and
rendering the higher quality version of the program from the combined layer
data and presenting it to the user.

[c28] 28. A process of using a computing device to provide progressively higher quality versions of an audio and/or video program over a client-server based network, comprising a server computer performing the process actions of: upon a first request from a client computer over the network to provide the program, providing a base quality version of the program to the client over the network, wherein the base quality version of the program comprises at least a base layer of a layered unicast; upon a subsequent request from a client computer over the network to provide a higher quality version of the program, requesting payment of a prescribed fee, providing at least one enhancement layer of the layered unicast to the client over the network upon payment of the prescribed fee.

[c29] 29. The process of Claim 28, wherein the process action of requesting payment of the prescribed fee is performed only upon a first request from a client computer over the network to provide a higher quality version of the program, and is not repeated thereafter.

[c30] 30. A computer-implemented process for providing progressively higher quality versions of an audio and/or video program over a client-server based network, comprising a server computer performing the process actions of: providing a base quality version of the program to a client computer over the network, wherein the base quality version of the program comprises at least a base layer of a layered unicast; and providing at least one enhancement layer of the layered unicast to the client over the network without also providing any layer of the base quality version of the program.

[c31] 31. The process of Claim 30, wherein the process action of providing a base quality version of the program comprises the action of providing the data making up each layer of the base quality version in sequential, equal-sized, temporally corresponding portions such that the layer portions associated with a time segment at the beginning of the program are provided first, and

then the layer portions associated with the next sequential time segment of the program are provided, and so on.

[c32] 32. The process of Claim 30, wherein the process action of providing at least one enhancement layer of the program comprises the action of providing the data making up each enhancement layer in sequential, equal-sized, temporally corresponding portions such that the layer portions associated with time segment at the beginning of the program are provided first, and then the layer portions associated with the next sequential time segment of the program are provided, and so on.

[c33] 33. A client-server based computer network for providing progressively higher quality versions of an audio and/or video program, comprising:
a server comprising at least one general purpose computing device; and
a computer program comprising program modules executable by the server, wherein the server is directed by the program modules to,
upon a first request from a client computer over the network to provide the program, provide a base quality version of the program to a client computer over the network, wherein the base quality version of the program comprises at least a base layer of a layered unicast, and
upon a subsequent request from a client computer over the network to provide a higher quality version of the program, providing at least one enhancement layer of the layered unicast to the client over the network without also providing any layer of the base quality version of the program.

[c34] 34. A computer-readable medium having computer-executable instructions for providing progressively higher quality versions of an audio and/or video program over a client-server based network, said computer-executable instructions comprising:
providing a base quality version of the program to a client computer over the network, wherein the base quality version of the program comprises at least a base layer of a layered unicast; and
providing at least one enhancement layer of the layered unicast to the client

over the network without also providing any layer of the base quality version of the program, wherein the at least one enhancement layer is a layer capable of being combined with the layer or layers of the base quality version of the program previously provided to produce said higher quality version of the program.

1. A method of providing a higher quality version of a program over a network, comprising:
providing a base quality version of the program over the network;
providing at least one enhancement layer of the program over the network;
receiving the base quality version of the program at a client device;
receiving the at least one enhancement layer of the program at the client device;
combining the base quality version of the program and the at least one enhancement layer of the program at the client device to produce the higher quality version of the program;
displaying the higher quality version of the program at the client device.